USDA United States Department of Agriculture | Forest Service | Northeastern Area State and Private Forestry | 180 Canfield Street Morgantown, WV 26505-3101

File Code: 3400
Date: October 1, 2007

Mr. Dwight Beall
Raystown Lake
US Army Corps of Engineers
RR1, Box 222
Hesston, PA 16647

Dear Dwight:

On September 10-13, 2007, USDA Forest Service personnel conducted a gypsy moth egg mass survey at Raystown Lake. The purposes of this survey were to assess the potential for defoliation and the need for treatment in thirteen areas that the US Army Corps of Engineers has proposed for treatment in 2008 (Figures 1a-1e). Theses thirteen areas total approximately 1700 acres and are valued for recreational purposes, wildlife habitat, aesthetics and or timber production. Another purpose of the survey was to evaluate the efficacy of this years' suppression project conducted on May 21 and 22. A single application of *Bacillus thuringiensis* var. *kurstaki* (Btk) was applied at the rate of 24 billion international units (BIU's) in 4 areas that totaled 1063 acres.

Gypsy moth survey plots were randomly selected based upon available host trees (oak species), size of sample area and uniformity between egg mass counts. At each sample point, a 1/40th acre fixed radius plot was established. The plots consisted of a tally of all the new (2007) egg masses observed on the overstory trees, understory vegetation, ground litter and duff. The total number of egg masses observed for each plot was multiplied by 40 to determine the number of egg masses per acre. Egg mass lengths were also measured at the plots to determine the overall "health" of the existing population and as a measure of egg mass fecundity.

The location of the survey plots in the proposed treatment areas are shown in Figures 1a-1e. The summarized results of the survey in these areas are presented in Table 1a-1m. In brief, overall egg mass densities in the thirteen proposed treatment areas ranged from 0-36,560 and averaged 2,826 egg masses per acre. Overall egg mass lengths tended to be moderate to large in size, ranging from 17-56 mm and averaging 28 mm. Egg masses larger than 25 mm typically indicate healthy populations.

The location of the survey plots within the 2007 treatment areas are shown in Figures 2a-2c and 1e (The proposed 2008 treatment block 13 was also treated in 2007). The summarized results of the egg mass survey in these four areas are presented in Tables 2a-2c and 1m. Overall egg mass densities in these four areas ranged from 0-8800 and averaged 1182 egg masses per acre, which is a 49.6 percent decrease from the pre-treatment (2006) level of 2347 egg masses per acre. Egg mass lengths in the four treatment areas tended to be moderate in size, ranging from 16-40 and averaging 27 mm. The pre-treatment length was slightly larger averaging 30 mm.

The egg mass survey results indicate that areas of light (30-50 percent) and heavy defoliation

(51-100 percent) are likely to occur in the thirteen proposed treatment blocks. Defoliation less than 30 percent generally has little impact on a tree and can not be detected through aerial surveys.

This defoliation prediction is further supported when egg density is also used as a means of estimating gypsy moth population densities. Moore and Jones (1987) found that estimating the mean fecundity would increase the precision of gypsy moth density estimates and that a linear relationship exists between egg mass length and fecundity. Further work by Liebhold et al., (1993) demonstrates that the product of the mean egg mass length (mm) and egg mass density provides a more precise means of estimating population densities and predicting defoliation. Using Liebhold's model, Figure 3 shows how this information can be used to correlate the predicted defoliation of an area. Accordingly, the estimated egg mass density of 3,432 masses per acre (average egg mass density in block 1) x 29 mm (average egg mass length in block 1) translates to a projected defoliation level of about 77 percent (heavy defoliation). Because egg mass densities and host type are not evenly distributed, actual defoliation will vary from tree to tree but will be predominately heavy throughout this area. Heavy defoliation is also expected for blocks 2 and 4-12 while light defoliation is expected for blocks 3 and 13 (Table 3).

This year's treatment provided pretty good results. Overall egg mass density was reduced approximately 49.6 percent while foliage protection was provided on approximately 97 percent of the treatment area (see defoliation report dated 7/2/07). However, approximately 33 percent of the area treated needs to be re-treated in 2008.

We concur with the need for treatment in all thirteen proposed areas. We recommend a double application of *Btk* applied at the rate of 36 BIU's per acre per application. Applications should be spaced 3-5 days apart. With proper application, gypsy moth defoliation should be minimal in these areas, a significant population reduction is likely and the need for re-treatment of these areas in 2009 is unlikely.

If needed, I will provide Jeff Krause assistance in developing the gypsy moth suppression contract.

Please call me at 304-285-1555 if you have any questions regarding this egg mass survey report.

Sincerely,

Rodney L. Whiteman

RODNEY L WHITEMAN
Forester
Forest Health Protection

Enclosures

Cc: Kevin Carlin, PA BOF
Tim Morasco, PA BOF
Lacy Evans, Baltimore District ACE
Noel Schneeberger, AO
Robert Lueckel, MFO

RLW/blm

REFERENCES

Liebhold, A.M., Simons, E.E., Sior, A., and Unger, J.D., 1993. Forecasting defoliation caused by the gypsy moth from field measurements. Environ.Entomol. 22(1): 26-32.

Moore, K.E.B. and Jones, C.G. 1987. Field estimation of fecundity of gypsy moth (Lepidoptera Lymnatriidae). Environ. Entomol. 16: 165-167

Table 1a – Gypsy moth egg mass survey results in Block #1 at Raystown Lake, September 10, 2007

Plot #	#em/acre	em size (mm)
1	560	-
2	2360	26, 28, 34
3	1440	30, 26, 36
4	1360	30, 26, 18
5	11,440	28, 30, 30

em/acre range = 560-11,440
em/acre average = 3432

em size range = 18-38
em size average = 29

Table 1b – Gypsy moth egg mass survey results in Block #2 at Raystown Lake, September 13, 2007

Plot #	#em/acre	em size (mm)
1	1880	28, 22, 38
2	1000	24, 34
3	1520	36, 42, 30
4	3160	26, 24, 24

em/acre range = 1000- 3160
em/acre average = 1890

em size range = 22-42
em size average = 32

Table 1c – Gypsy moth egg mass survey results in Block #3 at Raystown Lake, September 12, 2007

Plot #	#em/acre	em size (mm)
1	400	40, 32
2	320	30
3	960	36, 32
4	40	32
5	2440	32, 36, 28
6	40	22
7	80	-
8	4840	32, 40, 36
9	1800	40, 32
10	880	32

em/acre range = 40-4840
em/acre average= 1180

em size range = 22-40
em size average = 33

Table 1d – Gypsy moth egg mass survey results in Block #4 at Raystown Lake, September 10, 2007

Plot #	#em/acre	em size (mm)
1	5480	28, 34, 22
2	360	32, 20, 38
3	1040	34, 32, 22
4	3920	38, 34, 32
5	2040	34, 36, 30

em/acre range = 360- 5480
em/acre average = 2568

em size range = 22-38
em size average = 31

Table 1e – Gypsy moth egg mass survey results in Block #5 at Raystown Lake, September 10, 2007

Plot #	#em/acre	em size (mm)
1	3120	38, 34, 34
2	80	20, 28
3	800	20, 24 ,28
4	6560	24, 34, 28
5	1480	24, 34, 32
6	5560	30, 38, 36
7	1560	42, 30, 30
8	680	-
9	600	36
10	200	36, 39

em/acre range = 80- 6560
em/acre average = 2064

em size range = 20-42
em size average = 31

Table 1f – Gypsy moth egg mass survey results in Block #6 at Raystown Lake, September 10 and 12, 2007

Plot #	#em/acre	em size (mm)
1	14,760	26, 24, 22
2	0	-
3	11,680	22, 18, 20
4	3520	30, 32, 32
5	920	30, 27, 17
6	160	47
7	0	-
8	1520	35, 30, 30
9	240	56

em/acre range = 0-14,760
em/acre average = 3644

em size range = 17-56
em size average = 28

Table 1g – Gypsy moth egg mass survey results in Block #7 at Raystown Lake, September 10, 2007

Plot #	#em/acre	em size (mm)
1	11,920	40, 28, 20
2	2200	34, 32, 32
3	440	36, 20, 26
4	3120	24, 28, 34
5	1440	34, 32, 30
6	1920	22, 28, 28

em/acre range = 440-11,920
em/acre average = 4167

em size range = 20-40
em size average = 29

Table 1h – Gypsy moth egg mass survey results in Block #8 at Raystown Lake, September 11 and 12, 2007

Plot #	#em/acre	em size (mm)
1	1680	31, 29, 29
2	0	-
3	960	31, 31, 35
4	5880	28, 28, 26
5	7480	30, 24, 28
6	6600	36, 20, 32
7	5660	33, 36, 18

em/acre range = 0-7480
em/acre average = 4037

em size range = 20-36
em size average = 29

Table 1i – Gypsy moth egg mass survey results in Block #9 at Raystown Lake, September 11 and 12, 2007

Plot #	#em/acre	em size (mm)
1	6040	40, 46, 13
2	0	-
3	8320	43, 45, 29
4	0	-
5	200	50, 48, 33
6	1000	45, 33, 54
7	7000	12, 15, 38
8	0	-
9	4280	17, 42, 40
10	4520	28, 52, 43
11	160	47
12	1160	40, 36
13	2720	40, 40, 34
14	2920	24, 43, 30
15	0	-
16	9240	37, 30, 30
17	4440	40, 23, 40
18	36,560	30, 34, 27
19	7160	19, 22, 33

em/acre range = 0-36,560
em/acre average = 4443

em size range = 12-54
em size average = 35

Table 1j – Gypsy moth egg mass survey results in Block #10 at Raystown Lake, September 12, 2007

Plot #	#em/acre	em size (mm)
1	0	-
2	840	44, 31, 15
3	7760	28, 15, 23
4	0	-
5	240	35, 12, 15
6	9200	31, 35, 32
7	14,440	27, 32, 45
8	2120	32, 38, 39
9	0	-
10	200	38
11	200	42

em/acre range = 0-14,440
em/acre average = 3182

em size range = 12-45
em size average = 31

Table 1k – Gypsy moth egg mass survey results in Block #11 at Raystown Lake, September 12, 2007

Plot #	#em/acre	em size (mm)
1	3360	24, 22, 22
2	1640	26
3	5360	20, 30, 26
4	7680	30, 28, 28
5	3320	30, 18, 32
6	0	-
7	400	42, 28, 30

em/acre range = 0-7680
em/acre average = 3108

em size range = 20-42
em size average = 27

Table 1l – Gypsy moth egg mass survey results in Block #12 at Raystown Lake, September 12, 2007

Plot #	#em/acre	em size (mm)
1	880	26, 32, 30
2	4440	34, 34, 30
3	2280	24, 24, 36
4	4480	34, 34, 30
5	40	-
6	560	22

em/acre range = 40-4880
em/acre average = 2180

em size range = 22-36
em size average = 30

Table 1m– Gypsy moth egg mass survey results in Block #13 at Raystown Lake, September 11, 2007

Plot #	#em/acre	em size (mm)
1	1640	28, 40, 28
2	640	22, 24
3	120	-
4	240	32
5	0	-
6	160	-
7	1880	24, 22
8	4840	22, 26, 26
9	4680	32, 20, 26
10	120	30
11	5680	26, 22, 24
12	2040	20, 22
13	240	24
14	8880	22, 24, 22

em/acre range = 0-8800
em/acre average = 2226

em size range = 20-40
em size average = 25

Table 2a – Gypsy moth egg mass survey results in the 2007 Susquehannock Campground spray block, September 10, 2007

Plot #	#em/acre	em size (mm)
1	5480	28, 34, 22
2	360	32, 20, 38
3	1440	28, 32, 32
4	1040	34, 22, 32

em/acre range = 1040-5480
em/acre average =2080

em size range = 20-38
em size average = 29

Table 2b – Gypsy moth egg mass survey results in the 2007 spray block near Trough Creek, September 13, 2007

Plot #	#em/acre	em size (mm)
1	40	-
2	200	20
3	1080	32, 22, 30
4	520	36, 16, 18
5	0	-
6	0	-

em/acre range = 0-1080
em/acre average =306

em size range = 16-36
em size average = 26

Table 2c – Gypsy moth egg mass survey results in the 2007 spray block across from Seven Points, September 13, 2007

Plot #	#em/acre	em size (mm)
1	320	34, 22, 27
2	160	-
3	80	-
4	0	-
5	240	-
6	0	-
7	160	-
8	80	-
9	0	-

em/acre range = 0-320
em/acre average = 115

em size range = 22-34
em size average = 28

Table 3 – Predicted defoliation in the proposed spray blocks at Raystown Lake in 2008.

Block #	Predicted defoliation level	Predicted defoliation class
1	77%	heavy
2	55%	heavy
3	40%	light
4	68%	heavy
5	56%	heavy
6	78%	heavy
7	80%	heavy
8	80%	heavy
9	81%	heavy
10	78%	heavy
11	70%	heavy
12	56%	heavy
13	50%	light

Figure 1a.-- Gypsy moth egg mass survey plot locations in the proposed 2008 spray blocks 1 and 2 at Raystown Lake, September 10 and 13, 2007.

2007 Egg Mass Counts

- 0
- 1 - 250
- 251 - 1000
- 1001 - 5000
- > 5000

Proposed 2008 Spray Blk

0.3 0.15 0 0.3 Miles

N

AKS
10/07

Figure 1b.-- Gypsy moth egg mass survey plot locations in the proposed 2008 spray blocks 3 - 5 at Raystown Lake, September 10 and 12, 2007.

Figure 1c.-- Gypsy moth egg mass survey plot locations in the proposed 2008 spray blocks 6-10 at Raystown Lake, September 10 and 12, 2007.

2007 Egg Mass Counts

- 0
- 1 - 250
- 251 - 1000
- 1001 - 5000
- > 5000

Proposed 2008 Spray Blk

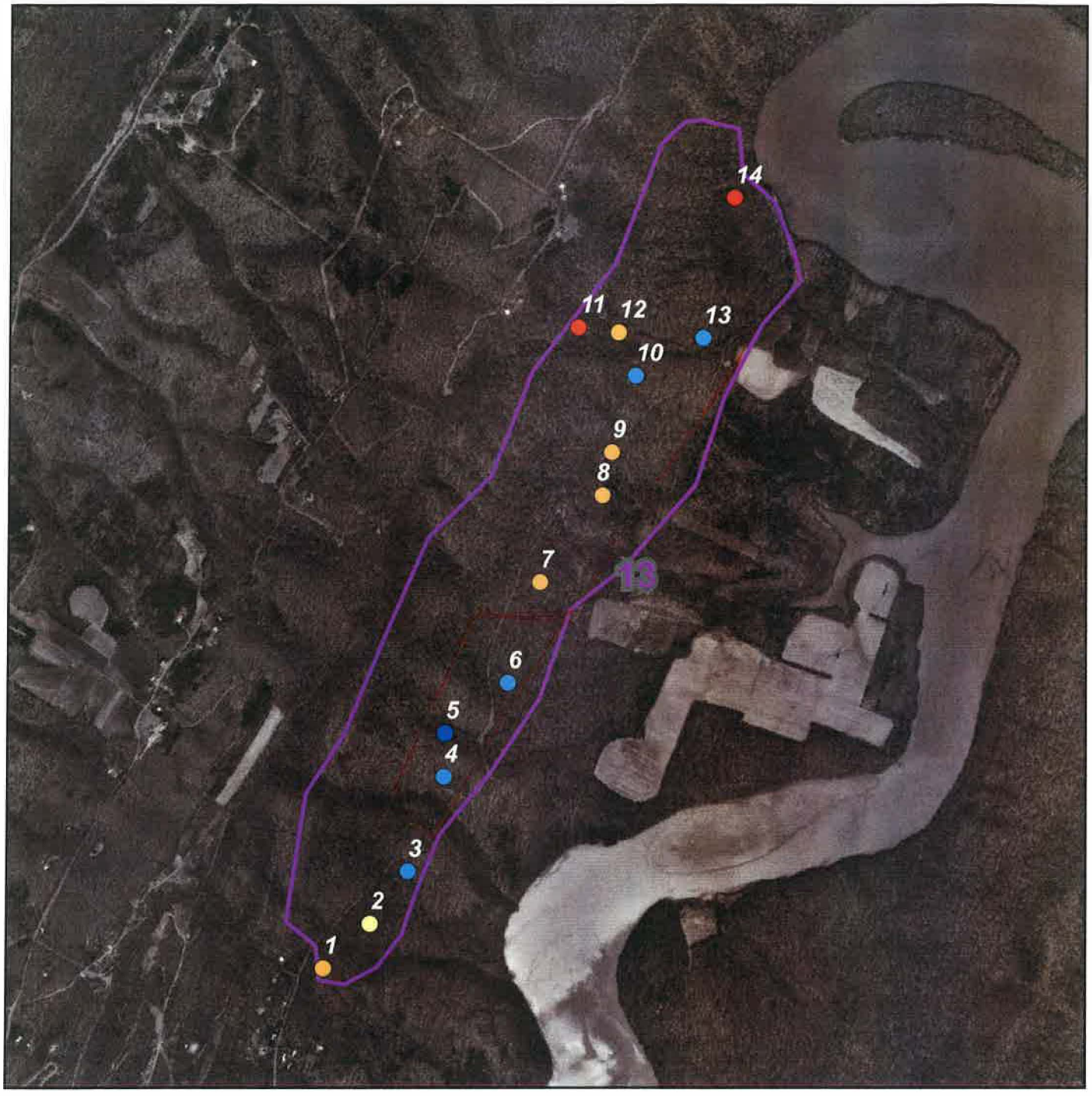
0.2 0.1 0 0.2 Miles

N

AKS
10/07

Figure 1d.-- Gypsy moth egg mass survey plot locations in the proposed 2008 spray blocks 11 and 12 at Raystown Lake, September 12, 2007.

Figure 1e.-- Gypsy moth egg mass survey plot locations in the proposed 2008 spray block 13 at Raystown Lake, September 11, 2007.



2007 Egg Mass Counts

Proposed 2008 Spray Blk

- 0
- 1 - 250
- 251 - 1000
- 1001 - 5000
- > 5000

0.2 0.1 0 0.2 Miles

N

AKS
10/07

Figure 2a.-- Gypsy moth egg mass survey plot locations in the 2007 Susquehannock Campground spray block, September 10, 2007.

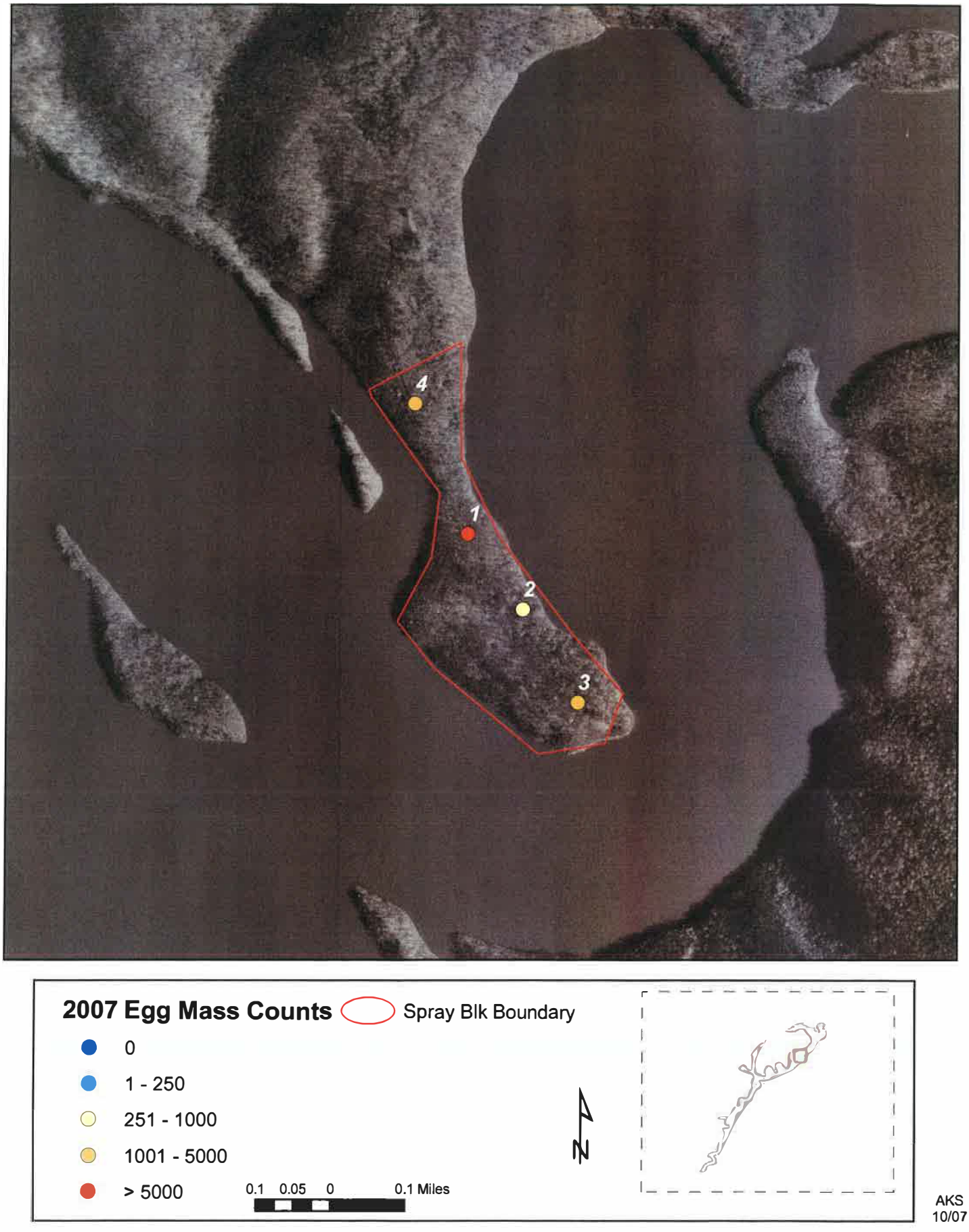


Figure 2b.-- Gypsy moth egg mass survey plot locations in the 2007 spray block near Trough Creek, September 13, 2007.

2007 Egg Mass Counts

Spray Blk Boundary

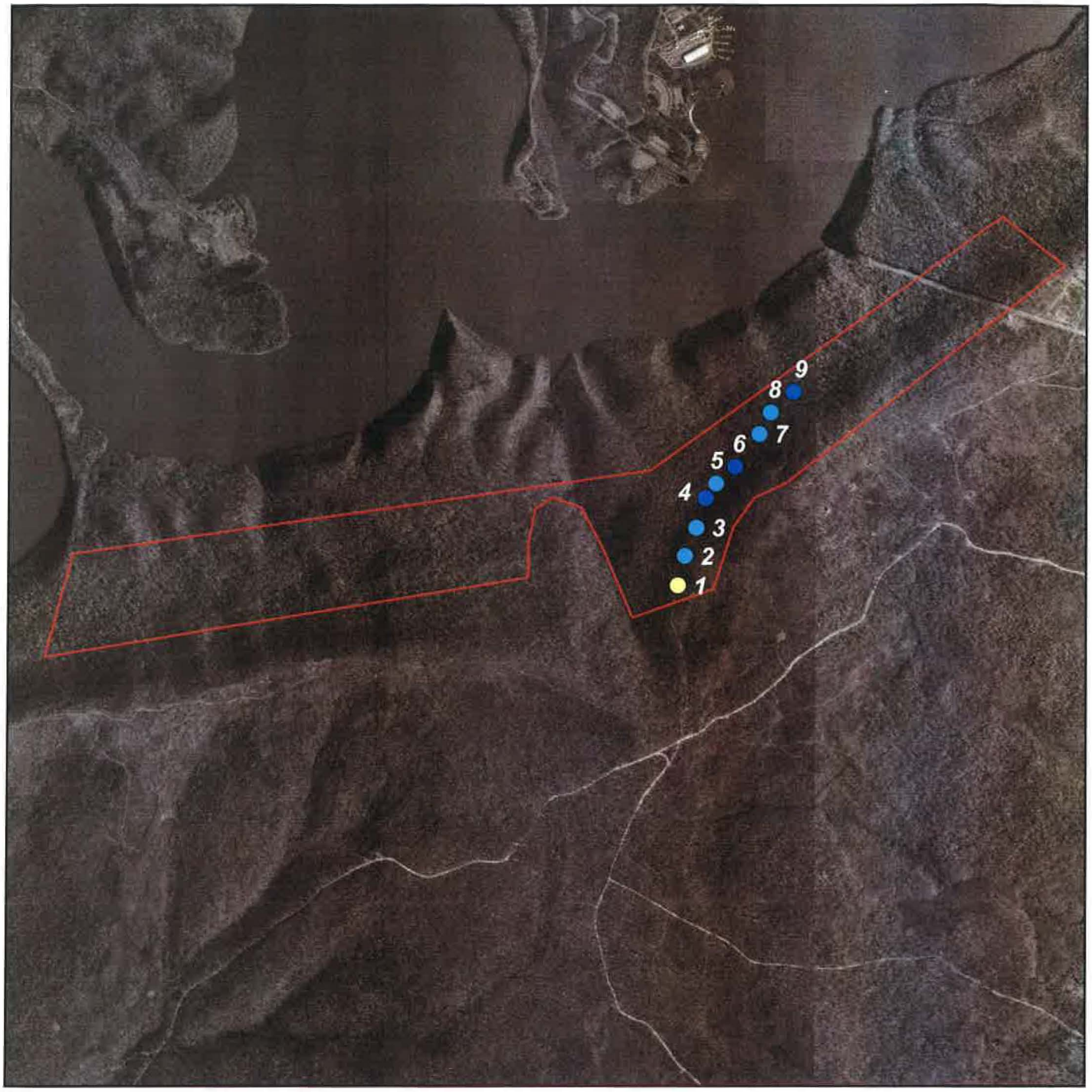
- 0
- 1 - 250
- 251 - 1000
- 1001 - 5000
- > 5000

0.2 0.1 0 0.2 Miles

N

AKS
10/07

Figure 2c.-- Gypsy moth egg mass survey plot locations in the 2007 spray block across from Seven Point September 13, 2007.



2007 Egg Mass Counts

Spray Blk Boundary

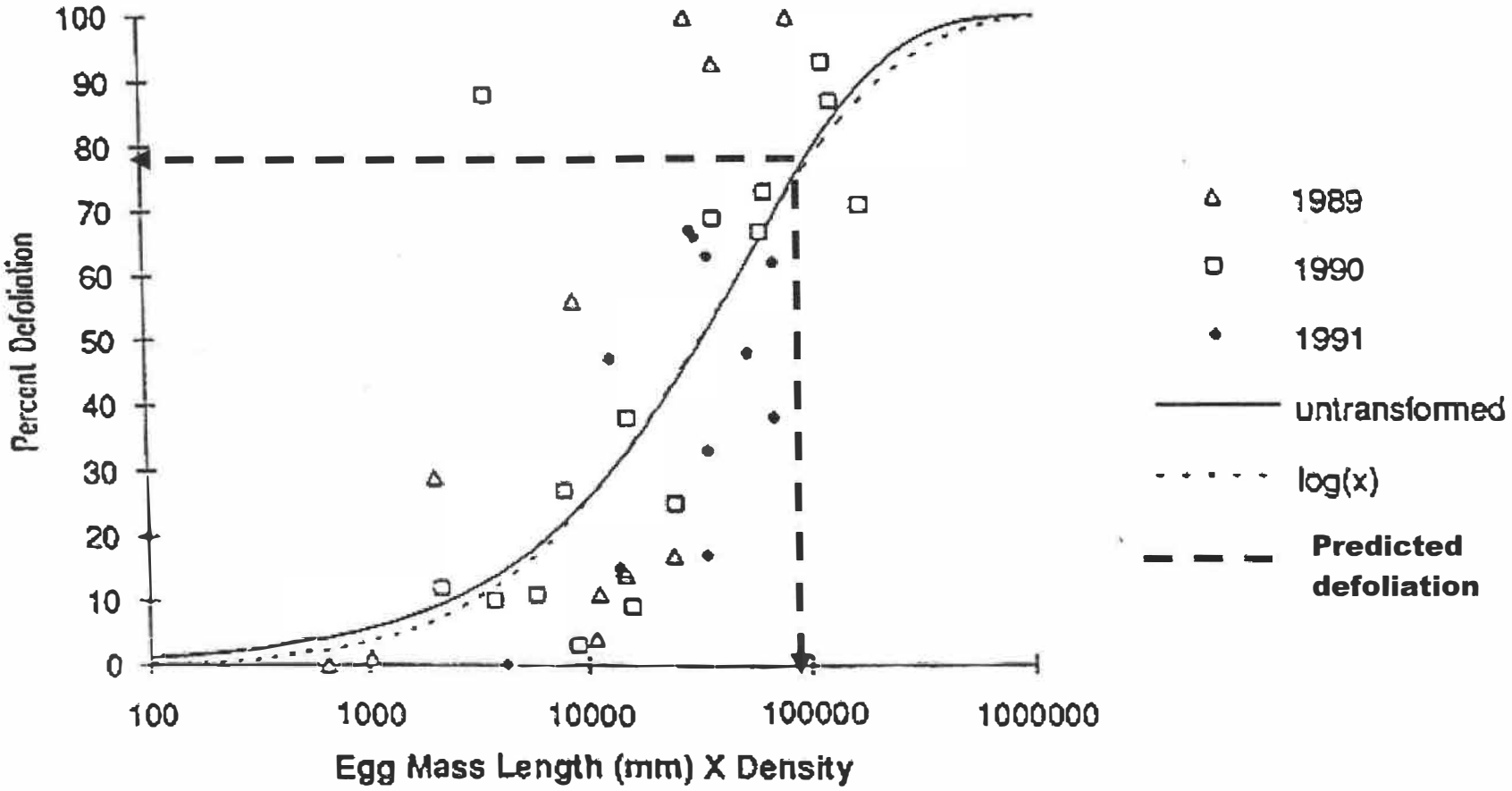
- 0
- 1 - 250
- 251 - 1000
- 1001 - 5000
- > 5000

0.25 0.125 0 0.25 Miles

N

AKS
10/07

Figure 3.—Predicted defoliation in block 1 at Raystown Lake in 2008.



Scatter plot of the product of mean egg mass length and egg mass density versus mean defoliation. Extracted from Liebhold et al. (1993).